

What is claimed is:

1. A unit cell for a solid oxide fuel cell comprising:

a substrate including a portion having a first porosity;

a battery element formed on the substrate and provided with an electrode layer and an electrolyte layer; and

a low porosity layer provided in at least one of the substrate and the battery element to have a second porosity lower than the first porosity, sizes of a plurality of pores of the low porosity layer ranging in a value equal to or less than 10 μm to laminate a part of the battery element on the low porosity layer.

2. The unit cell according to claim 1, wherein the low porosity layer is composed of material to be included in the electrode layer, and the electrolyte layer including solid oxide is formed and laminated on the low porosity layer.

3. The unit cell according to claim 2, wherein the low porosity layer functions as the electrode layer.

4. The unit cell according to claim 1, wherein the material of the low porosity layer is composed of material to be included in the electrolyte layer, and the electrolyte layer including solid oxide is formed and laminated on the low porosity layer.

5. The unit cell according to claim 1, wherein the low porosity layer is composed of material to be included in the substrate, and the battery element is formed and laminated on the low porosity layer.

6. The unit cell according to claim 5, wherein the low porosity layer functions as a part of the substrate.

7. The unit cell according to claim 1, wherein the low porosity layer includes a first low porosity layer and a second low porosity layer,

and wherein porosity of the second low porosity layer is lower than porosity of the first low porosity layer.

8. The unit cell according to claim 7, wherein the first low porosity layer is composed of material to be included in the substrate and the second low porosity layer is composed of material to be included in the electrode layer,

and wherein the second low porosity layer is formed and laminated on the first low porosity layer, and the electrolyte layer including solid

oxide is formed and laminated on the second low porosity layer.

9. The unit cell according to claim 1, wherein the low porosity layer has a thickness equal to or less than 500 μm .

5 10. The unit cell according to claim 1, wherein the low porosity layer has a surface roughness Ra equal to or less than 5 μm .

11. The unit cell according to claim 1, wherein the second porosity of the low porosity layer is equal to or less than 10 %.

12. The unit cell according to claim 11, wherein the second porosity of the low porosity layer decreased toward the battery element.

10 13. The unit cell according to claim 1, wherein each of the electrode layer and the electrolyte layer has a thickness equal to or less than 50 μm .

14. The unit cell according to claim 1, wherein the substrate has a gas permeability.

15 15. A method of manufacturing a unit cell for a solid oxide fuel cell comprising:

preparing a substrate including a portion having a first porosity;

laminating a battery element provided with an electrode layer and an electrolyte layer on the substrate; and

20 forming a low porosity layer in at least one of the substrate and the battery element to have a second porosity lower than the first porosity, sizes of a plurality of pores of the low porosity layer ranging in a value equal to or less than 10 μm to laminate a part of the battery element on the low porosity layer.

25 16. The method of manufacturing the unit cell for the solid oxide fuel cell according to claim 15, wherein the low porosity layer is formed by at least one of a slurry coating method and a green sheet sintering method.

30 17. The method of manufacturing the unit cell for the solid oxide fuel cell according to claim 15, wherein at least one of the electrolyte layer and the electrode layer is formed by a physical vapor deposition method.